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ABSTRACT

Current training strategies implemented in online Web-based training (WBT) sessions are rather simple strategies. They lack a number of typical classroom training strategies, such as: composite training strategies, the possibility to customize and adapt training strategy, and collaborative training strategies. This paper presents a novel WBT tool called Virtual Classrooms, which was implemented to support such aspects. The intention was to mirror at least a small part of the typical classroom experience into online training sessions in a WBT environment. Virtual Classrooms are implemented as part of the modern WBT system called WBT-Master. (Contains 14 references.) (Author)

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Implementing Complex Web-Based Training Strategies with Virtual Classrooms

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Abstract: Current training strategies implemented in online WBT training sessions are rather simple strategies. They lack a number of aspects of typical classroom training strategies, such as composite training strategies, possibility to customize and adapt training strategy, collaborative training strategies, and so on. In this paper we present a novel WBT tool called Virtual Classrooms, which we implemented to support such aspects. By doing so we wanted to mirror at least a small part of the typical classroom experience onto online training sessions in a WBT environment. Virtual Classrooms are implemented as a part of the modern WBT system called WBT-Master.

1. Introduction

From the users' point of view WBT systems deal with online training sessions. Learners (students) are participating in different training sessions, whereas teachers (tutors, authors) are preparing and conducting those training sessions.

Conceptually, a WBT training session consists of a number of training objects and a particular training strategy (Helic et al., 2000; Helic et al., 2001a; Helic et al. 2002). Training objects might be learning courses, learning goals, discussion forums, etc. On the other hand, a particular training strategy reflects a particular way of working through the subset of training objects to achieve a particular training goal. Such a training strategy might be considered as a certain training methodology.

Technically, a training methodology is implemented as a collection of WBT tools combined to support the desired way of working with the WBT system (Helic et al., 2001a). For example, consider the basic WBT training strategy known as Web-based learning. This training strategy is a collection of WBT tools, such as simple navigation links (prior/next/up), course maps, course syllabus, etc. Those tools provide functionality needed to work with simple WBT learning courses, i.e., to access, browse, navigate, and read through such courses (Dietinger and Maurer, 1998).

All WBT systems support at least the basic WBT training strategy, but usually they also support a number of more advanced strategies.

For example, o-Learning Suite (Dietinger and Mauerer, 1998) supports a training strategy called organizational learning (Malone et al., 1999). Organizational learning is supported by sophisticated WBT tools, which provide the access to the so-called Corporate Memory (Abecker et al., 1999; Ackermann, 1994), made up of information that is found within a company in the form of not only learning courses, but also other documents, discussion forums, etc.

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Another advanced WBT system, WBT-Master (Helic et al., 2000; Helic et al., 2001; Helic et al., 2001a; Helic et al. 2001b; Helic et al., 2001c; Helic et al., 2002), supports a wide range of different WBT training strategies, such as Web-based tutoring (Helic et al., 2001a) (tools leading students through a sequence of learning actions to a particular learning goal), Web-based mentoring (Helic et al., 2001a, Helic et al., 2001c) (tools supporting synchronous online mentoring sessions), and so on.

Obviously, WBT systems that support not only the basic Web-based learning, but also a number of advanced online training strategies can be much more effective in an online learning process. Let us just consider the following simple example. Suppose a WBT tutor has two groups of students and WBT-Master system installed in his organization. The students from the first group prefer to work with the learning material in some kind of a "guided tour", i.e., they prefer if the tutor leads them through the learning process by pointing out what to do at each step of the learning process. Thus, for the first group of students the tutor might conduct a training session supporting Web-based tutoring strategy. On the other hand, the students from the second group prefer to work with the learning material in a more free and associative way. Thus, this group can be the subject for Web-based learning strategy.

If we compare advanced WBT systems with more typical ones (that just support Web-based learning) we may see that the advanced ones provide at least more flexibility in choosing a particular training strategy for online training sessions.

Usually, advanced WBT systems provide even more (Helic et al., 2001a): synchronous/asynchronous communicational facilities, collaboration tools, sophisticated customization mechanisms, progress tracking, etc. These facilities tremendously improve not only the overall quality of the conducted online training sessions, but also the experience of all participants (learners and teachers) of these sessions.

Nevertheless online training sessions still lack a number of important aspects of any typical classroom session (Plagemann and Goebel, 1997; Simoff and Macher, 2000; Schneidermann et al., 1995). Let us mention here just a few of these aspects.

A training strategy in a classroom session can be composed of a number of more simple training strategies. Such simple training strategies can be combined in a number of ways: they can be applied at the same time, in a time sequence, etc. For example, a classroom training session on object-oriented programming might start with the lecture on object-oriented programming concepts (the first training strategy) and then move over to students having to write an object-oriented program and apply the concepts from the lecture (the second training strategy).

Moreover, since the teacher in the classroom training session immediately gets the feedback about the applied training strategy he may adapt it accordingly. Thus, the classroom training strategy is not only a composite (heterogeneous) strategy, but it can be also adapted, or even extended on the fly. On the other hand, particular training strategies in online training sessions are rarely composite, but rather they are simple and atomic.

Usually, we can just select one of such simple atomic (Web-based learning is an example of an atomic online training strategy) training strategies from the strategies that are supported by the system in order to conduct our training sessions. Even if we have the possibility to pick an advanced training strategy (such as Web-based tutoring, which in fact can be composed as a sequence of different more atomic training strategies) we still lack the possibility to adapt such training strategy in a synchronous manner as the result of an immediate students' feedback.

Another important aspect is the collaborative aspect of any classroom training strategy. Writing the object-oriented program from the example above by a group of students can be achieved only if all students from the group work in collaboration. Many of current WBT systems lack such collaborative aspects completely, needless to say that they lack support for a collaborative training strategy and that maybe in the scope of a more heterogeneous, adaptable online training strategy.

Obviously, supporting at least such basic aspects of classroom training sessions in an online WBT environment would improve the experience of all WBT users (Brusilowsky, 1998). Learners would be confronted with more sophisticated training strategies; they would have a possibility to work in collaboration with other learners, and they would have a feeling that they are being "heard", since the training strategy adapts to their needs. Tutors would not be restricted to a certain simple training strategies, but they would have the possibility to create sophisticated, customized training strategies, which can be adapted in the real time to students' preferences. Thus, they would obtain more freedom in implementing their training sessions.

We implemented a simple WBT tool called Virtual Classrooms that support the above aspects and try to mimic as closely as possible a typical classroom training session in a WBT online environment. This tool is a part of the advanced WBT system: WBT-Master.

2. Virtual Classrooms Concept

Conceptually, WBT-Master Virtual Classroom is a special synchronous/asynchronous collaborative training and working environment. A Virtual Classroom provides all necessary tools for both tutors and learners that they need to conduct training sessions with highly sophisticated, adaptable, extensible and collaborative training strategies.

Usually, a tutor creates a single Virtual Classroom to support an online training session. The created classroom comprises:

- All training objects that are needed to conduct the training session.
- All WBT tools that reflect the particular (usually composite or heterogeneous) training strategy for that training session.
- All communication/collaboration tools needed for collaborative synchronous/asynchronous work.

Virtual Classroom allows the tutor to use any kinds of WBT-Master training objects (i.e. courses, goals, documents, even other classrooms, etc.) available in the system. Further, both the tutor, as well as the learners may upload local files and use these files as training objects in that particular training session. Also, the tutor may remove training objects from the Virtual Classroom.

A particular training strategy is reflected through the kind of training objects that the tutor provides for the learners. Thus, whenever the tutor selects a training object for the training session the system automatically recognizes the type of that training object (e.g. learning course, learning goal, etc.) and provides all the tools that are necessary to work with that training object. For example, if the tutor selects a simple learning course, all navigational tools such as course map, course syllabus, etc. are immediately available for the learners, thus reflecting Web-base learning strategy. Similarly, if the tutor selects a learning goal all tools needed to guide the learners through the sequence of the learning actions contained in that goal are automatically available, thus reflecting Web-based tutoring strategy. Since, any number of training objects may be inserted into the Virtual Classroom the tutor may in that way create rather composite and heterogeneous training strategies. The adaptability and extensibility is guaranteed in the way that the tutor may add, even remove training objects from the created Virtual Classroom at any given time.

At all times the learners may see the tutor and other classmates presence, communicate via the special messaging mechanism or work together on a certain document.

3. Virtual Classrooms in WBT-Master

Technically, Virtual Classroom consists of the following components (see Figure 1):

- *Virtual Classroom Library* is a collection of WBT-Master training objects selected for the particular training session. As we already mentioned training objects of any type may be selected for such classroom library.
- *Training Curriculum* is a description of the training session. The curriculum explains what actions should be performed by learners and in which sequence. Thus, the curriculum can be also seen as the starting training strategy of using the resources and classroom tools for achieving a particular training goal. Of course, as we already mentioned at any given time the tutor may adapt or extend this training strategy.
- *Classroom Locker* is a repository of materials (i.e. files) uploaded to the WBT-Master server by users working with this particular Virtual Classroom. Obviously, the Classroom Locker is a shared repository in the sense that users may upload their local files and/or references to existing Internet resources (URL) to make them available for other users. The locker might be seen as the primary tool for collaborative learners' work.

- *Classroom Forum* is a sequence of messages (on-the-fly contributions) made by the learners of the virtual classroom. The classroom messages may refer to files/references previously uploaded to the classroom locker.
- *Classroom Blackboard* is a special window where a currently selected training resource is visualized. The Classroom blackboard may be individual or shared. In case of an individual blackboard, the learners are free to select any of previously defined training resources and/or elements from the classroom locker to work through on such individual blackboard. In case of the shared blackboard, the classroom tutor may select training resources and files for all participants of the classroom. The blackboard (especially the shared blackboard) may be seen as the primary tool applied in order to adapt the training strategy, since the tutor may receive an immediate feedback from the learners in a synchronous manner. Of course, the forum might be used all the time for providing the feedback in a more asynchronous manner.

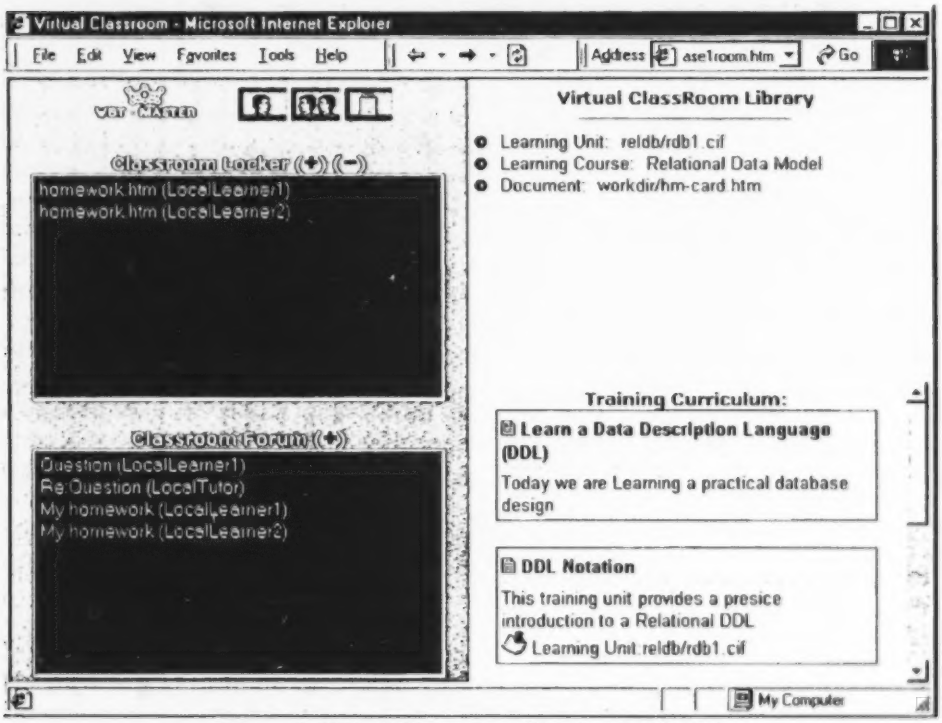

Figure 1: Virtual Classroom without a blackboard

User interface solutions in Virtual Classroom tool are rather simple and intuitive. For example, the classroom library is displayed as a list of items. Clicking on a particular item in that list results in activating a new blackboard window, which allows working with this particular training object.

Once when the blackboard is activated the set of tools needed to work with that type of training object is automatically provided for the learners. Thus, if a learning course is selected all tools associated with learning courses are displayed (see Figure 2). In that way it is guaranteed by the system that a particular training strategy that the tutor had in mind is actually implemented.

In the case of the shared blackboard the tutor gets additionally few tools for synchronous communication with the learners. For example, the tutor may use a special pointer to point to certain areas on the screen and write additional comments on that pointer.

Note that similar synchronous communication mechanisms are available for the learners all the time. Thus, they may at any given time obtain information about the online presence of other learners, send them messages, or comments to documents that they are working together, and so on.

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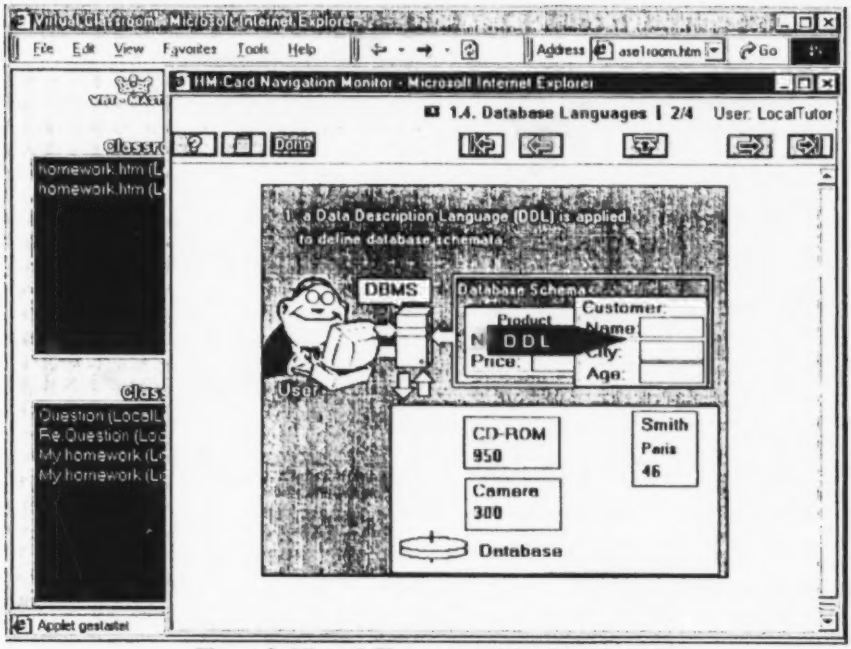

Figure 2: Virtual Classroom with a blackboard

The Classroom locker and classroom forum are also represented as lists of items. In the case of the classroom locker the list represents all documents uploaded by the learners, and in the case of the classroom forum the list holds all contributions. In both cases, special Add and Remove buttons are available for adding or deleting an item from the list (see Figure 1).

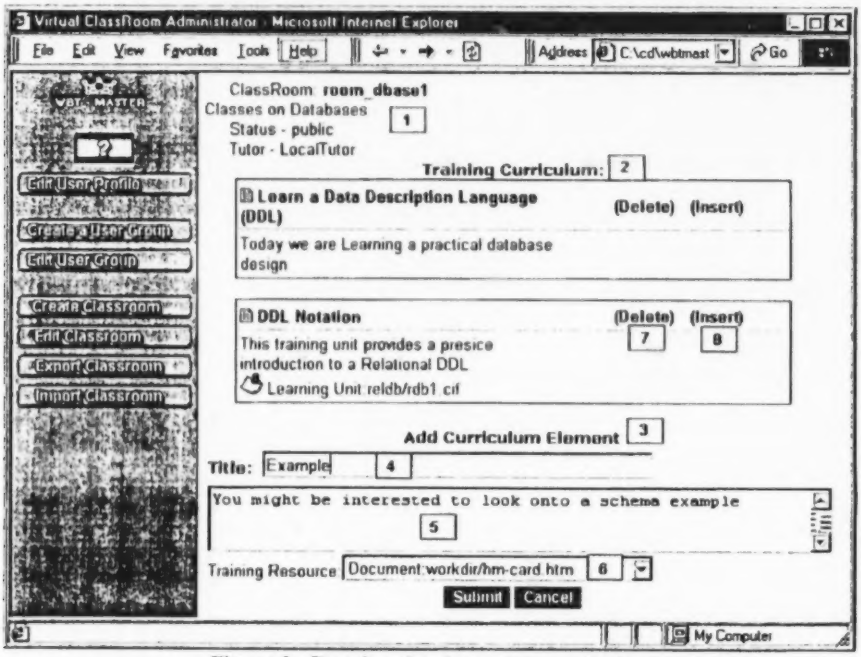

Figure 3: Creating the classroom curriculum

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An additional administration screen is provided for the tutor. Basically, the tutor works all the time just with the curriculum and classroom library. Thus, at the beginning of each training session the tutor creates the starting curriculum and selects a number of training objects for that curriculum. As the training session progresses he might need to modify the curriculum and/or the classroom library. The administration screen allows the tutor to do so (see Figure 3).

Another interesting aspect of the administration subsystem is the possibility to export and import virtual classrooms. For example, the tutor wants to move a very successful Virtual Classroom from one WBT-Master server to another one. Thus, the tutor exports the Virtual Classroom from the first server (all training objects, the curriculum, etc. are exported) and imports this Virtual Classroom into the second server. All needed information is restored on the second WBT-Master server.

Lastly, since WBT-Master supports a highly sophisticated user access control mechanism the tutor may define the access rights for all the learners by using the administration subsystem.

4. Conclusion

We saw that a Virtual Classroom provides an integrated working environment for all of its participants.

The tutor may create a Virtual Classroom with particular training objects and a particular training strategy for any training session, which he/she is going to conduct. Typical example would be a special organization offering training sessions on a contract basis. Each employee of such training organization may be provided with a special virtual classroom where he/she would define a particular classroom library of training objects by selecting from a big repository of training objects accumulated by the training organization of its main assert. Taking into account, a particular customer's training request the tutor may also define a very special classroom curriculum for this customer.

On the other hand, the learners participating in the Virtual Classroom are provided with all tools needed not only to work through the selected training objects, but also with tools that allow them to communicate with other learners and to work together with them on certain documents. Thus, by working in such Virtual Classroom environment the learners are provided with a strong classroom feeling.

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